On the Syntax of Prepositional Phrases

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ABSTRACT

The standard view about the uniformity of Case assignment by verbs and prepositions is challenged with data from German and an analysis according to which P has a feature structure which involves a Case feature that may not only participate in Case checking but may supply the Case that is missing in the complement of P. Adopting a probe/goal relation of agreement a fair number of peculiarities of the syntax of PPs can be explained such as obligatory pied piping, semantic selection, copy movement, operator scope and the role of adverbial pro-forms in pronominal PPs. Finally, the asymmetry in Case assignment between V and P is supported by novel data from sentence processing.

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1. Overview

Standard assumptions about prepositions (P) and prepositional phrases (PP) are that (i) P is a lexical head on a par with V, A, N, and that (ii) PPs are on a par with VP, AP, NP. In particular, (iii) P is thought to assign Case to its complement just like V and A. We summarize some of the evidence indicating that these assumptions meet with a number of problems. Some of these problems have been noticed elsewhere, perhaps most lucidly in Grimshaw (1991).[1] In Grimshaw's system of projection extension, PP is the highest extension of N such that N projects to N' and NP, then via D to D' and DP, and finally via P to P' and PP. The idea behind projection extension is that P shares with D and N the categorial feature (in Grimshaw's system [+N, −V]), a proposal that has been made in a more elaborate form by van Riemsdijk (1990; 1998). In section 2 we will point out some of the notorious asymmetries between P/PP and other X/XP. These will encompass pied piping and selection as already discussed by Ross (1987) and Grimshaw (1991), but also novel evidence stemming from findings about copy movement, pronominal PPs, bare indefinites and quantifier binding. Taking up the idea that P is not only a lexical but also a functional head, a theoretical proposal will be made in section 3 which will in section 4 be applied to some of the cases which create a problem for the standard view about P as a lexical head and Case assigner. Evidence from sentence processing in

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[1] An earlier source is Ross (1967). Ross suggested that PPs undergo pied piping because they are simply a special kind of NP.

favor of the theoretical conclusions will be presented in section 5. The results are summarized in section 6.

2. Distinctive Properties of P and PP

2.1 Pied Piping

The data in (1) through (3) show that, in German, as in many other languages, wh-movement must not pied-pipe verbs or adjectives etc. while pied-piping of P is obligatory.

(1) a.   Wo   hat sie gewohnt?   „Where did she live?"
         where has she   lived
     b.   *[Wo gewohnt] hat sie?

(2) a.   Wem ist sie treu?   „Who is she faithful to?"
         whom is she faithful
     b.   *[Wem treu] ist sie?

(3) a.   *Wen hat sie für gearbeitet?
          who has she for worked
     b.   [Für wen] hat sie gearbeitet?   "Who did she work for?"

If P were a lexical head with Case assignment functions just like V and A, why should pied piping of PP be forced while pied piping of VP and AP is hardly ever possible? In Grimshaw's (1991) system "the PP is just as much a wh phrase as the DP" because PP is an extension of DP and as such representative of the wh feature inherent in DP, a privilege that PP does not share with the purely lexically headed phrases NP, VP and AP.

2.2 Semantic selection

Directly connected with the issue of (obligatory) pied piping is the fact that s(emantic) selection of the wh feature seems to work "through" the P-head, as Grimshaw (1991) points out. Although the wh-phrase remains in the complement of P, movement of PP to SpecCP turns

CP into a +wh-marked complement. The following German data show that s-selection does not operate across typical lexical heads like V or A.

(4) a.   Peter wollte   wissen [CP [PP **in** welchem Stadtteil]   Anita wohnt]
        Peter wanted know   in which   town-part Anita lives
        "Peter wanted to know in which part of town Anita lives"

  b. *Peter wollte   wissen [CP [VP [PP in welchem Stadtteil]   **wohnen**] Anita möchte]
        Peter   wanted know   in which   town-part live   Anita wants

  c. *Peter wollte   wissen [CP [AP [PP auf welchen Stadtteil]   **stolz**] Anita ist]
        Peter   wanted know   of   which   town-part proud Anita is

2.3 Copy movement

Like various languages of the world, German shows the phenomenon of the CORRESPON-DENCE EFFECT (cf. van Riemsdijk, 1983), also known as PARTIAL MOVEMENT (cf. McDaniel, 1988 and for comprehensive discussion Lutz, Müller & von Stechow (2000)). In this construction, it is not the wh-operator proper which is extracted from a clause but there is rather an unmarked wh-pronoun, in German *was* ("what") as shown in (5) which signals the path of movement and marks the scope of the wh-operator.

(5) Was glaubst du, was   Anita meint, wem   wir vertrauen können?
    what believe you what Anita thinks whom we trust   can
     "Who do you believe Anita thinks we can trust?"

One less widespread variant of this construction is copy movement, i.e. a variant that obeys the constraint of cyclic movement just like (5) but displays a copy of the bona fide operator at each SpecCP.

(6) Wem glaubst du, wem   Anita meint, wem wir vertrauen können
    whom believe you whom Anita thinks whom we trust   can
    same as (5)

Uncontroversial phrases must not appear in copy movement. An example is given in (7). There seems to be one single exception: PPs with an uncomposed wh-complement as shown in (8a).

(7) *[Wie schön]   glaubst du, [wie schön]   Anita meint, [wie schön]   wir singen
    how beautifully believe you how beautifully Anita thinks   how beautifully we sing
    müssten um   in den Thomanerchor   aufgenommen zu werden?
    must   in order in the Thomaner-choir admitted   to become
    "How beautifully do you believe Anita thinks we would have to sing to be admitted
    to the choir of St.Thomas?"

(8) a. [Mit wem] glaubst du, [mit wem] Anita meint, [mit wem] wir uns   treffen sollten?
    with who believe   you with who Anita thinks with who   we REFL meet   should
    "Who do you believe Anita thinks we should meet with?"
    b. *[Mit welchen Linguisten] glaubst du, [mit welchen Linguisten] Anita meint, [mit
    welchen Linguisten] wir uns treffen sollten?
    "Which linguist do you believe Anita thinks we should meet with?"

PPs with a head-like (i.e. uncomposed) wh-complement appears to pattern with other head-like simplex wh-pronouns instead of patterning with other phrases. This finding constitutes further evidence for the special status of P in comparison with other lexical heads such as in (7).

2.4 Pronominal PPs

Like English *there*, *where* and *here*, the German pro-forms *da*, *wo* and *hier* are by all counts adverbs but not nouns.[2] We expect examples like *Da / wo / hier wohnt niemand* ("nobody lives there / where / here"). As is shown in (9), these adverbs cannot replace DPs. The question is how *da* and the wh-element *wo* can serve as a (Case bearing?) argument in the context of a pronominal PP as shown in (10).

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[2] The German forms *da* and *wo* have lost a final /r/ in late Old High German, while Dutch, English and other Germanic languages have retained it, cf. Dutch *daar, waar*, and English *there, where*. /r/ has not been lost in the German form *hier*. Cf. Paul (1916: 355).

(9) a. *Da ist schön   (nominative required)

        there is nice

   b. *Ich habe da   angeschaut   (accusative required)

        I   have there looked-at

(10) a. Ich habe damit   gerechnet   „I reckoned with it"

        I   have therewith reckoned

   b. Womit   hast du   gerechnet?   „What did you reckon with?"

     wherewith have you reckoned

If *da* and *wo* are not even nominal, the well-formedness of (10a,b) is a strange exception in a theory that takes P as assigning Case to its complement just like V (and I or T) does.

2.5 Bare indefinites

As Gallmann (1996; 1997) has observed, bare indefinites are perfect nominatives and accusatives as shown in (11a) and (11b) respectively, but they are incapable of serving as datives. The latter is shown in (12) where the verb *schaden* („to harm") requires dative Case.

(11) a. Allerlei / etwas   / genug / mehr / nichts / viel /   wenig ist schiefgegangen

     a lot   / something / enough / mehr / nothing / much / little has gone-wrong

   b. Wir haben allerlei / etwas   / genug / mehr / nichts / viel   / wenig erlebt

    we have a lot / something / enough / mehr / nothing / much   / little experienced

(12) *Feuchtigkeit schadet allerlei / etwas   /genug /mehr / nichts / viel   / wenig

    humidity   harms a lot / something / enough / more nothing / much / little

As Bayer, Bader & Meng (2001) have argued, the reason for this Case asymmetry is that the structural Cases rely on functional structure that is associated with the transitive and/or finite verb. Thus, overt Case marking is in a sense superfluous. The morphological exponent of dative Case can, however, not be suspended. Datives are not formally licensed by the functional structure associated with the verb. In other words, datives have to bring their own functional

structure into the derivation. The Case morphology, which is missing in the indefinites shown in (11) and (12), is obviously the exponent of their functional structure.[3] Surprisingly, the requirement of overtly marking dative Case is suspended in the context of a P.[4]

(13) Otto ist mit allerlei / etwas   / genug / mehr / nichts   / viel   / wenig zufrieden

    Otto is with a lot   / something / enough / more / nothing / much / little   content

This constitutes another striking piece of evidence in favor of a special status of P and the projection headed by P.

2.6 Quantifier binding

Let us finally point to a semantic problem that has given rise to much debate and to highly controversial analyses. The problem is that quantified DPs cannot normally bind pronominal

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[3] For similar thoughts cf. den Dikken (1991).

[4] Andrew McIntyre (p.c.) points out that overt Case must still be present in complements of genitive assigning prepositions. The examples in (i) show genitive assignment, the examples in (ii) show that the assignment of overt genitive Case is indespensible although head-governed genitive is lexical on all counts:

(i)   anhand / bezüglich   / mittels   [verschieden-er   Maßnahmen]
          with   / with-respect-to / with-the help different   -GEN means/orders

(ii)   *anhand / *bezüglich   / *mittels   nichts
        with   / with-respect-to / with-the help   nothing

Similarly the pro-form in pronominal adverbs (cf. section 2.4) cannot be the Caseless *da* or *wo* but must bear genitive morphology as seen in (iii).

(iii)   a. de -s +wegen,   b. we -s +wegen,   c. mein-et   wegen
        this-GEN because-of   what-GEN because-of   I   -GEN because-of

One should notice that this exception is not totally unexpected. German has between 36 and 40 elements which assign genitive Case to their complement. These elements are often morphologically complex, of highly heterogeneous origin, often not fully grammaticalized to function words, mainly part of the written language, and regularly affected by substitution of the the stylistically prescribed genitive by the non-standard dative, in which case the insertion of an uninflected nominal becomes immediately acceptable. Consider here (v) which maps onto the colloquial use of the dative seen in (iv) which exists next to the stylistically correct genitive:

(iv)   wegen   [verschieden-er   / verschieden-en   Maßnahmen]
        because-of different   -GEN / different   -DAT means/orders

(v)   wegen   nichts
        because-of nothing

Another interesting difference is that prepositions which assign genitive Case cannot be used in copy movement. (vi) is in marked contrast with (8a):

(v)   *Anhand / bezüglich   / mittels   wessen   glaubst du anhand / bezüglich / mittels
        with   / with-respect-to / with-the help who/what-GEN believe you
       wessen man sich orientieren sollte?
        one REFL *orient should*
       intended: With (respect to/the help of) what/who do you believe one should find an orientation?

Quite obviously, genitive assigning preposition deserve close scrutiny, which unfortunately we cannot offer in the present context. It should be equally obvious, however, that there seem to be substantial structural differences which the traditional unifying classification as "prepositions" tends to obscure rather than to elucidate.

variables if they do not c-command them, cf. (14).[5] But binding is clearly successful if the quantified DP is the complement of P, as seen in (15).

(14) *[Die **Suche** [nach [[jedem / keinem Fundamentalisten]₁]] hat seine₁ Festnahme bewirkt
   the search for each / no fundamentalist has his arrest yielded

(15) Die Polizei suchte [**bei** [jedem / keinem Fundamentalisten]₁] nach seinem₁ Paß
   the police looked at each / no fundamentalist for his passport

2.7 Preliminary conclusion

The list of distinctive phenomena concerning the status of P and PP could be continued. Law (1998) gives a cross-linguistic account of P-stranding in Romance and Germanic which rests on the claim that P-stranding is blocked whenever D incorporates into P. Such incorporation is manifest in suppletive forms in French (*de le du*, *à le au* etc.), Italian (*a il al*, *con la col la* etc.) and other Romance languages, but also in German (*an dem am*, *mit einem/dem mit'm* which may phonetically reduce to [*mim*] etc.). Law's proposal is that elements which have been affected by a suppletive rule must form an X°, and that as a consequence, extraction from the complement of P would amount to the movement of a non-constituent. The assumption is that in the non-stranding languages D-to-P incorporation holds even if there is no audible reflex of suppletion. Without trying to explore Law's predictions with respect to P-stranding, we simply note here that the suppletive forms which replace P°+D° appear to supplement our findings about the special role of P and PP presented before in an interesting way. No comparable effects can be observed in the Case-licensing configurations that relate V or A with their respective nominal complements. We can therefore conclude that P plays a very special role that should not be confused with the role which is played by other (Case assigning) lexical heads.[6] We will try to formulate an alternative below which

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[5] There appear to be certain exceptions which we believe can be explained, but which cannot be discussed here for reasons of space. Earlier work on LF has usually assumed that operators can be QRed out of PP (cf. von Stechow, 1996 among others) even though most languages disallow overt movement out of PP. A very unconventional proposal about phrase structure appears in Pesetsky (1995). Pesetsky proposes a layer of *Cascade Syntax* in which the string P + DP does not form a constituent. This enables quantified DPs to bind „as if" they were not contained in PP. The consequences of the proposal are substantial but cannot be reviewed here.

[6] Andrew McIntyre (p.c.) witnesses a problem if there are cases of sluicing in which the sluiced CP should echoe a PP but can actually do with a simplex wh-NP. This is possible in English, as shown in (i) but the examples from German in (ii) and (iii) are more or less deviant. The difference goes in the expected direction.
 (i) Yesterday she talked to someone for half an hour but I have forgotten (to) who.

does justice to the distinctive nature of P and PP. Our proposal resembles van Riemsdijk's and Grimshaw's by the assumption that P is (at least) partially a functional head. It differs from theirs, however, in various details. Unlike Grimshaw (1991) we do not need to assume that PP is a categorial extension of NP and DP. Unlike van Riemsdijk (1990) we do not need to confine the functional part of P to a directional/deictic postpositional head.[7]

3. P as a probe

We will now sketch a proposal that can help explaining at least some of the properties that distinguish P from other lexical heads. Our assumptions are inspired by the Minimalist Program but deviate from its currently received form in certain ways. We will indicate this where it is not obvious. Our assumptions are the following:

(i) P is a head which involves lexical-semantic as well as formal-functional features, in other words, P is what Corver and van Riemsdijk (2001) call a semi-lexical (or semi-functional) head. This situation squares with the intuition that P belongs somehow to the "closed class", although its contentive part may denote semantic relations of various kinds. The contentive part can in certain cases be severely reduced, e.g. in German *von*, English *of*, Italian *di* etc.

(ii) P agrees with its complement XP with respect to a number of formal features among which categorial features and Case features will be those in the center of our interest.[8]

(ii) Gestern   hat sie mit jemandem eine halbe Stunde gesprochen, aber ich habe
      yesterday has she with someone   one   half   hour   spoken   but I   have
      vergessen *(mit) wem.
      forgotten (with) who

(iii) Gestern   hat sie an jemanden einen Brief geschrieben, aber ich habe vergessen ??(an) wen.
      yesterday has she to someone a   letter written   but I   have forgotten   (to) who

[7] For van Riemsdijk (1990), PP is actually a lexical projection which may be selected by a functional head p° which either dominates a directional/deictic element like *hinauf*, or into which P° may move. In the latter case a postpositional PP results such as *des schlechten Wetters wegen* (the bad weather-GEN because-of", „because of the bad weather"). This system is further developed for German in Zeller (2001) and for Dutch in Koopman (1997). Since all of these seem to follow the standard analysis according to which a lexical P assigns Case to its object, we will not go into any more details.

[8] In German, P does not agree with XP in terms of the phi-features person, number, gender and is also not compatible with these features. Completion with features can only be up to compatibility. In German, P is for instance not compatible with features which can otherwise only be spelled out on N, D, A or V among which are person, gender and number. This is perhaps not necessarily so. McCloskey and Hale (1984) have shown that P inflects for person and number in Irish.

(iii) If P is a "probe" and XP is a "goal", agreement between probe and goal in terms of the formal feature <F> will remove at least one occurrence of <F>, the standard assumption being that <F> disappears from the probe. This is the core of feature checking, also known as "feature valuation".

(iv) Agreement between P and its complement XP may be incomplete, probe and goal agreeing only in a subset of their formal features.

(v) If agreement is incomplete as said in (iv), the features <F', F'', ...> of the probe which are missing in the goal must be compatible with the features of the goal, and the features <F', F'', ...> of the goal which are missing in the probe must be compatible with the features of the probe. In other words, probe and goal may be respectively underspecified for each other's features. The case in which the feature set of the probe is completed via agreement amounts to the FREE RIDE principle of Chomsky (1995, 268 ff) according to which features may undergo pied piping.

(vi) The V-projection is associated with the functional elements T and v which establish the structural Cases nominative and accusative respectively.

(vii) The V-projection lacks functional elements that could establish a probe/goal relation for checking lexical Cases such as dative and genitive, i.e. there is nothing like AgrIO. Dative objects are arguments by virtue of argument structure, but they are adjuncts by virtue of formal licensing.[9]

(viii) NPs/DPs with lexical Case must be associated with their own functional shell. This is the *Kase Phrase* KP, the exponent of K being the overt Case morphology which is obligatory in datives and genitives (cf. Bayer, Bader & Meng, 2001).

The core of the proposal is that P or rather a substructure of P is the equivalent of a functional head which serves as a probe for the valuation of formal features. Our suggestion is that in the process of probe/goal agreement features of the probe can be supplemented by features of the goal and vice versa. Importantly, these possibilities do not hold for V or A. The reason is that V and A are truly lexical heads which must be associated with extra functional

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[9] A similar point has been made by Vogel & Steinbach (1995).

structure for Case checking etc. This is clearly the case for the verb for which we follow the minimalist assumption that it requires T and *v* for the licensing of the structural Cases.[10]

We will show next how the above assumptions can help explaining some of the peculiar properties of P and PP described in section 2.

4. Accounting for the properties of P and PP

Let us first look at the expected case of checking, namely the one where the object of P carries overt Case. In the derivation in (16), both the probe P and the goal *den Gästen* ("the guests") carry the categorial feature <D> and the Case feature <dat>. The probe is valuated by the operation AGREE which amounts to the removal of the feature on the probe. Removal is indicated by strike-out.

(16) a.   b.

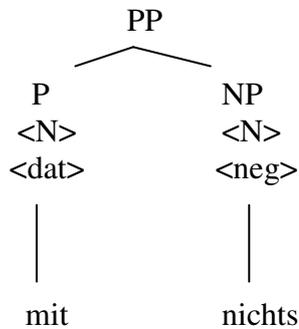| PP | | PP |
P DP	==AGREE ==>	P DP
<D> <D>		<D̶> <D>
<dat> <dat>		<d̶a̶t̶> <dat>
| /\		| /\
mit den Gästen		mit den Gästen
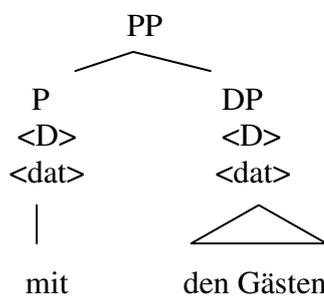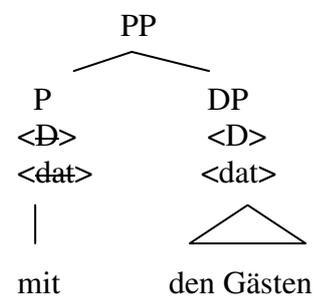
Consider next the bare indefinites which were introduced in section 2.5. These indefinites lack a feature <dat>. If they were potential datives, they should serve as verb-selected datives, but as we have seen they don't. Assuming that P has a functional sub-structure which embraces <dat>, agreement is incomplete (cf. iv). P and its complement do agree with respect to the D-feature (or in the present case rather an N-feature). According to (v), merging P with a bare indefinite and agreement will lead to a structure in which a sub-structure of P endows the in-

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[10] One could emphasize the parallel between lexical P° and the other lexical heads by proposing a functional counterpart p°. To avoid unnecessary complications related to word order we simply assume here that the functional side consists of a subset of features inherent in P°.
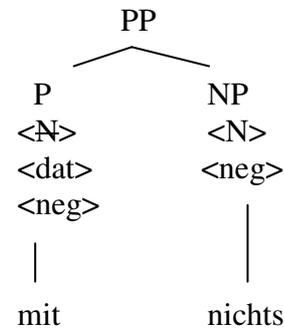
definite with what one may conceptualize as a „Case affix".[11] The resulting structure guarantees that the indefinite bears Case and as such escapes the Case Filter.

(17) a.   b.

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              PP                                               PP
           /     \                                          /     \
      P          NP          == AGREE ==>           P          NP
     <N>         <N>                               <N̶>         <N>
    <dat>       <neg>                             <dat>       <neg>
                                                  <neg>
      |           |                                 |           |
      |           |                                 |           |
     mit        nichts                             mit        nichts
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In (16b) the feature <dat> has vanished from P due to agreement, but in (17b) it stays, the reason being that the goal does not have the corresponding feature and can thus not delete it in the probe. Only if P itself is the exponent of Case rather than the Case assigner can we explain the peculiar asymmetry between indefinites in the context of V and in the context of P. The process must not be mistaken as feature sharing in the sense of spec-head agreement. As (17b) shows, the feature <dat> is not shared. The negative indefinite *nichts* bears the feature <dat> in (17b) as little as elsewhere. Dative Case is exclusively contributed by the functional substructure of P. Once NP is merged with P, NP + <…., dat, …> results, but this is only due to the concatenative process. In other words, P does not assign Case but rather IS the Case. Since V does not establish a functional structure for a dative object nothing of this sort is possible when a dative-selecting V such as *schaden* ("to harm") merges with an indefinite. As (12) has shown, seintences such as *Feuchtigkeit schadet nichts* ("humidity harms nothing") are ruled out.

Our proposal extends directly to the problem addressed in section 2.6, namely that operators appear to c-command out of PPs. If operators are represented in syntax as formal features like <wh>, <qu> and <neg>, and are compatible with the features of P, which as such is, of course, not specified for these features, probe/goal agreement will endow PP with operator

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[11] Notice that indefinites are in principle compatible with dative Case. The German words *viel* („much") and *wenig* („little") may optionally inflect for Case. If they do, they can be freely used as datives in any environment. The same holds for Swiss German where one finds for „something" the form *öppis+em* (*etwas*+dat).

features by virtue of FREE RIDE (cf. v).[12] This is shown in (17) for an example of a PP with the negative indefinite *nichts* ("with nothing"). The important point is that by a purely formal process of agreement with the categorial feature <N> (vulgo „N-feature checking"), PP will turn into a negative operator. (17b) shows two occurrences of the feature <neg>. The (simplifying) assumption is that <neg> could not have been valued before a position of sentential scope (e.g. NegP) has been accessed. Once the negatively marked PP has accessed a proper scope position, <neg> will be activated and the agreeing features on PP and NP will disappear. This has the effect that the indefinite *nichts* is converted to an existentially bound variable.[13]

Our account explains why PP, unlike other major categories, does not induce a barrier for the scope of an operator. The licensing of a negative polarity item like German *jemals* ("ever") gives direct support to a solution according to which syntactically the entire PP counts as a negatively marked phrase.

(18)   Otto ist [PP mit **nichts**] **jemals** wirklich zufrieden gewesen

Otto is with nothing ever   really   content   been

"Otto was with nothing ever content"

Given that the wh feature is equally transferred to P and PP by virtue of probe/goal agreement we capture Ross' (1967) observation that PPs behave somehow like NPs and Grimshaw's (1991) claim that in the case of wh-PP movement we are not really dealing with pied piping but rather with the movement of a wh-phrase despite the fact that the left edge of the phrase is occupied by a category that is not +wh as such. In particular for German, which does not allow P-stranding we expect the well-formedness of wh-questions like (3b) and s-selection as in (4a), both of which we repeat for convenience.

(3)   b.   [**Für** wen] hat sie gearbeitet?

"Who did she work for?"

(4)   a.   Peter wollte   wissen [CP [PP **in** welchem Stadtteil]   Anita wohnt]

"Peter wanted to know in which part of town Anita lives"

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[12] Unlike Case features and phi-features, the operator features <wh>, <qu> and <neg> can inhere adverbs, cf. German *wann* ("when"), *immer* ("always") and *nie* ("never"). So the assumption of PP getting endowed with operator features is not unnatural.

[13] We cannot go further into the Logical Form and semantics of operator scope. For a semantic account of pied piping in terms of choice functions cf. Sternefeld (2001). For a relevant account of negative indefinites according to which <neg> is a formal feature that has to be checked off cf. Weiß (2002).

Given that quantifiers are pre-nominal modifiers, either determiners or adjectives, and as such part of the agreement system, we expect that probe/goal agreement lifts the feature <qu> from D to DP and from P to PP. In an example like (15), PP may then be universally quantified. The possessive pronoun *seinem* to its right is not c-commanded by the quantified DP but it is c-commanded by the quantified PP.

(15) Die Polizei suchte [$_{PP<qu>}$ bei [**jedem** Fundamentalisten]$_1$] nach seinem$_1$ Paß

 the police looked   at   each fundamentalist   for his   passport

It should be noticed in this connection that the feature <qu> is categorially independent of DP or NP (cf. note 12). For instance, the treatment of donkey anaphora in Heim (1988) makes crucial use of adverbs of quantification (cf. Lewis, 1975) which may be silent as in conditionals.

(19)   ~~ALWAYS~~$_{1/2}$ [[if a farmer$_1$ has a donkey$_2$] he$_1$ beats it$_2$]

The quantificational force which enables the pronouns to count as bound variables does not come from anything like the two DPs which fail to c-command them but from the understood adverb of quantification. The feature <qu> which appears on PP in (15) should be seen as an abstract representation of the universal quantifier that has (or attains in the course of additional derivational steps) scope over the proposition which contains the bound variable pronoun.

We will finally take a look at pronominal PPs, in particular at the fact that their argument appears to be an adverbial. An important finding is that the category adverb appears to be lost as soon as *da, wo, hier* join the left side of P. Consider the contrasts in (20) and (21) where we use the preposition *von* which allows both a locative adverbial and a nominal complement.[14]

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[14] Andrew McIntyre (p.c.) tells us that colloquial English allows more PPs with a locative complement, e.g. *in there*, *on there*, *through there*. Pronominal adverbs like *thereafter*, *therein*, *thereof* etc. resemble the German forms in also showing a nominal interpretation of *there*. As Müller (2000:172f.) points out, these forms have ceased to be productive after 1400 and survive in the modern English only a fossilizations.

(20) a. Der Angriff ist von da   gekommen   „The attack came from **there**"

       the attack   is from there come

    b. *Anita hat von da   geschwärmt

       Anita   has from there raved

(21) a. *Der Angriff ist davon   gekommen

       the attack   is thereof come

    b. Anita hat davon   geschwärmt   "Anita raved about **that**"

       Anita has thereof raved

Da is interpreted as a locative adverb in (20) but as a nominal argument in (21). If there is raising of *da, wo, hier* to the specifier of P as is often suggested, this operation must induce a re-categorization in favor of a nominal category. There is a debate about whether these elements are truly adverbial and therefore lack Case or do have nominal features and Case after all. Trissler (1993) argues for the former, Wiltschko (1993) for the latter position. Müller (2000) appears to have a compromise in mind. He suggests that *da* is an underspecified general pro-form whose meaning is fixed contextually. Following this intuition, we may say that it is by raising to SpecPP that *da* acquires nominal features and can as a consequence also acquire Case.[15] For us the question of central importance is why the apparent categorial mismatch occurs precisely in the context of P. The answer will, of course, be that this has to do with the fact that P is partially a functional head, and that the functional side of P encodes features which are relevant for licensing *da, wo, hier* as nominal arguments. The phenomenon of P-stranding which is attested for *da* and *wo* in many varieties of German suggests that pronominal PPs do not necessarily form a phonological word (as suggested by liaison and syllabification.)[16] Words can normally not split up in processes of movement. Furthermore, various dialects show a doubling phenomenon which suggests that P does not actually fuse with the adverb but with a coindexed clitic.

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[15] We have to ignore here the complication that stems from raising of elements which are already unambiguously nominal and carry overt Case such as *des+wegen* (this-GEN-for, „therefore") and *des schlechten Wetters wegen* (the bad weather-GEN because-of", „because of the bad weather") which is also acceptable with prepositional word order. There seem to be diachronic processes involved which obscure a straightforward account. Also cf. note 4.

[16] E.g. *da+mit* does not retain the diachronically underlying segment /r/ as found in *dar* (or Dutch *daar*) but compositions with prepositions which start with a vowel do as seen in *darauf* which is syllabified as $[_\sigma da]$ $[_\sigma rauf]$.

(22) a. weil   viele da   dr -auf gewartet haben

        because many there CL-for waited   have

        „because many were waiting for that"

    b. weil da_1 viele t_1 dr-auf gewartet haben

Bayer (1996: ch.3) therefore suggests that it is actually the clitic /də/ or /dr/ which moves and is coindexed with the movable *da* which is base-generated either in SpecPP or in an even higher position.[17] In varieties where no doubling arises, a null clitic (Ø) may be involved. Movement of the clitic is triggered by the requirement that the clitic finds a local host. Consider the case of *da drauf* (literally "there there+on").

(23) $[_{PP}\, da_1\; [dr_1\; [_P\, auf]]\; t_1]$

Here the clitic could not have stayed in the position of its trace. Let us assume that it is a head which adjoins to the P-head. It is important for our present concern is that by joining P this clitic acquires from P both a nominal feature and the Case feature that P encodes. Provided that the clitic does not possess any of these features at the beginning of the derivation, the N-feature and the Case-feature inherent in P cannot be checked off and therefore have to stay in the derivation.[18] This is what the derivation in (24) expresses, where in b. the clitic raises to P, and where in c. the full form *da* is merged into SpecPP after the clitic has acquired the nominal (here D or N) feature as well as the Case feature.
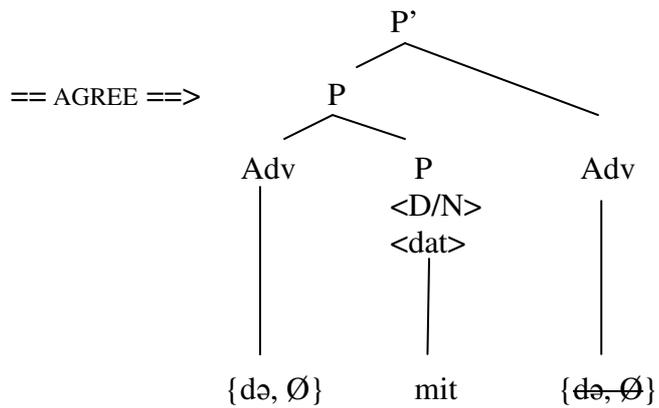
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[17] The latter has been suggested in Koopman (1997) for Dutch. Koopman proposes a PlaceP on top of PP into whose specifier *da* would move. However, given that the interpretation of *da* does not necessarily involve a locative interpretation (cf. (20) and (21) above) we would not share her terminological choice.

[18] Readers may have noticed that we did not make any assumptions about the interpretability of features. If we would have to decide, we would have to say that all the undeleted features in the probe are interpretable and therefore survive on the way to the semantic system. We are not aware of any empirical reason that could be decisive on this issue.
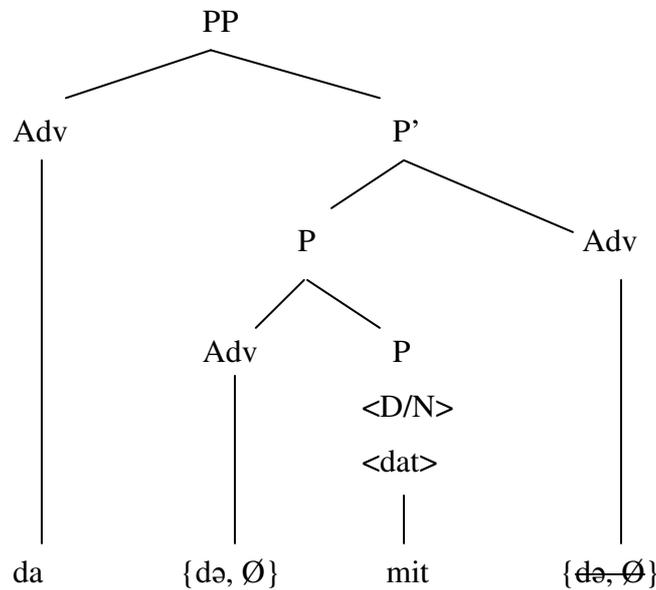
(24) a.   b.

```
        P'                                              P'
       / \                  == AGREE ==>               / \
      P   Adv                                         P   \
   <D/N>                                             / \   \
   <dat>                                          Adv   P   Adv
     |      |                                      |  <D/N>  |
     |      |                                      |  <dat>  |
    mit   {də, Ø}                               {də, Ø} |  {d̶ə̶,̶ ̶Ø̶}
                                                        mit
```

== MERGE ==>

```
                        PP
                       /  \
                    Adv    P'
                     |    / \
                     |   P   Adv
                     |  / \    |
                     | Adv P   |
                     |   <D/N>  |
                     |   <dat>  |
                     |    |  |  |
                    da {də, Ø} mit {d̶ə̶,̶ ̶Ø̶}
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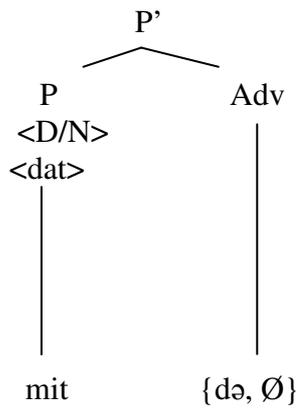
If the clitic is a general adverbial pro-form with an impoverished feature matrix, prefixation to P has exactly the effect of turning it into a nominal and Case-bearing constituent. The transition from (25a) to (25b) shows that the features <D/N> and <CASE> which remain undeleted in P endow the adverbial clitic with what is needed to license it as a nominal argument.[19]

(25) a. [P [Adv clitic] [P [..., <D/N>, <CASE>]]]   ===>

    b. [P [CASE [D/N [Adv clitic]]] [P [...]]]

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[19] The suggested process is empirically supported by similar processes which are traditionally analyzed with the help of morphological conversion. Typically such processes require the context of a function word, e.g. in German *das Hier und Jetzt* ("the here and now"), in English *to microwave* etc. If our reasoning goes into the right direction there is no actual conversion but rather featural supply that emanates from the associated function word. For further discussion of this point cf. Bayer (2002).

To conclude this section, we have shown in which sense P is partially a functional category which bears an agreement relation with its complement. With respect to the inherent Case dative, we have shown how probe/goal agreement can endow certain indefinites with the required Case feature although these indefinites lack a morphological Case paradigm and are as such normally excluded as datives. By the mechanism of agreement it could also be made clear how the operator features for wh, negation and quantification can have sentential scope while on the surface appearing as in the scope of P. Much of the findings about PP pied piping, s-selection and copy movement can be explained along these lines.[20] Finally we could explain how the adverbial pronouns in pronominal PP can function like nominal arguments, and why they can do so only in the local context of a preposition.

5. Evidence from sentence processing

In this final section we will show that the theoretical proposal that has been sketched so far is supported by experimental results from language processing, in particular by experiments that tap into syntactic parsing as it proceeds in the time course of reading. Experimental studies by Hopf, Bayer, Bader & Meng (1998) and Bader & Bayer (2006) have established that the HUMAN SENTENCE PROCESSING MECHANISM (HSPM) has an on-line prefererence for assigning accusative (structural) Case to a Case-ambiguous NP/DP whereas dative (lexical) Case is dispreferred. Given that lexical Case in general has to be expressed morphologically, the proposal by Bayer, Bader & Meng (2001) has been that DPs with lexical Case require an extra shell which Bayer et al. (2001) dubbed KP – cf. (viii) in section 3. Under this assumption, the accusative preference follows from general economy principles of the HSPM by which the least amount of structure is postulated which is grammatically compatible with the input at any time point in the parse. A well-known principle of this kind is the MINIMAL ATTACHMENT principle proposed by Frazier (1978), which was generalized to the SIMPLICITY principle by Gorrell (1995). SIMPLICITY requires that there be no vacuous structure building. Thus, the postulation of a dative is predicted to be a last resort option.

Considered more generally, the experimental evidence from the studies mentioned above but also from other studies strongly suggests that in the case of an ambiguity the preferred Case is

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[20] Our approach turns out to be more conservative than Grimshaw's (1991) approach of projection extension because we do not have to claim that PP is literally an extension of N. Our results follow essentially from the fact that P is a functional head which shares some feature(s) with its complement, and a form of checking that involves the free ride of features into an underspecified feature matrix.

the nominative. If the nominative has to be dismissed, the next option is the accusative. Switching from the unmarked structural Case (nominative) to the marked structural Case (accusative) is rather easy for the HSPM as long as the need to do so is transparently signalled by the mismatch that triggers the switch. However, switching from one of these structural cases to a lexical Case – which in German could only be the dative – is a comparatively difficult operation, even if transparently signalled. The preference for structural Case over lexical Case has been established in terms of response time latencies and brain activities.

The theoretical proposal of P as an exponent of Case rather than an assigner of Case leads to the following expectation: The processing difficulty for Case-ambiguous dative DPs should be reduced in PP if the DP is an object of P in comparison with a situation in which the dative DP is an object of V. The reason would be that in the case of P, no extra phrase structure, namely a KP, would have to be postulated post hoc, and, more importantly, lexical reaccess would not be necessary if P is an overt formal exponent of Case and thus Case does not have to be provided by the object of P, in contrast to the object of V. Note that no processing difficulties should occur for accusative within PPs, either. That is, the strong processing asymmetry between accusative and dative that has been observed for objects of verbs should disappear for objects of prepositions.

Bader and Häussler (in prep.) compared the on-line processing of accusative and dative Case in the context of P and in the context of V in several experiments. The basic contrasts are shown in (26) and (27). The sentence pair in (26) illustrates the comparison between accusative and dative in the context of V; (27) illustrates the same comparison in the context of P.

(26)   <u>Case dependent on V</u>

      a. <u>Accusative</u>

        Ich glaube, dass der Direktor **die Omas/ein paar Omas**   unterstützt hat

        I   believe that the director the grannies/a pair grannies-ACC supported has

        „I believe that the director supported the grannies/a couple of grannies"

      b. <u>Dative</u>

        Ich glaube, dass der Direktor **den Omas/ein paar Omas**   geholfen hat

        I   believe that the director the grannies/a pair grannies-DAT helped   has

        „I believe that the director helped the grannies/a couple of grannies"

(27) Case dependent on P

    a. Accusative

Ich glaube, dass der Direktor **an die Omas /   ein paar Omas**   gedacht hat

I   believe that the director at the grannies / a pair grannies-ACC thought has

„I believe that the director thought of the grannies / a couple of grannies"

    b. Dative

Ich glaube, dass der Direktor **an den Omas /   ein paar Omas**   verzweifelt ist

I   believe that the director at the grannies / a   pair grannies-DAT despaired   is

„I believe that the director was driven to despair with the grannies / a couple of grannies"

All experiments used a speeded grammaticality judgment task in which each sentence was presented word-by-word in the middle of a computer screen. The subjects, students of the University of Konstanz, were instructed to respond to the grammaticality or ungrammaticality of the received sentence as fast as possible by pressing a yes or a no key at the end of the sentence. Responses had to meet a deadline of 2000ms. Six different prepositions were used, all of which are compatible with accusative or dative Case: *an* ("at"), *auf* ("on"), *über* ("about"/"above"), *hinter* ("behind"), *neben* ("next to"), *vor* ("in front of"), depending on the verb's aspectual interpretation.

Representative results from Bader and Häussler (in prep.) are shown in Figure 1 in terms of garden-path strength. Garden-path strength is obtained by subtracting mean percentages of correct answers for locally ambiguous sentences from mean percentages of correct answers for corresponding unambiguous control sentences. The four conditions shown in Figure 1 correspond to experimental sentences of the type illustrated in (26) and (27). Thus, the data point labeled "Accusative, Verb" in Figure 1 corresponds to the difference between mean percentages for sentences like (26a) with *die Omas* (unambiguous) as object and sentences like (26a) with *ein paar Omas* (ambiguous) as object, and similar for the other data points in Figure 1.

Figure 1

Garden-Path Strength (percentages of correct answers for unambiguous sentences minus percentages of correct answers for ambiguous sentences) for sentences as in (26) and (27)
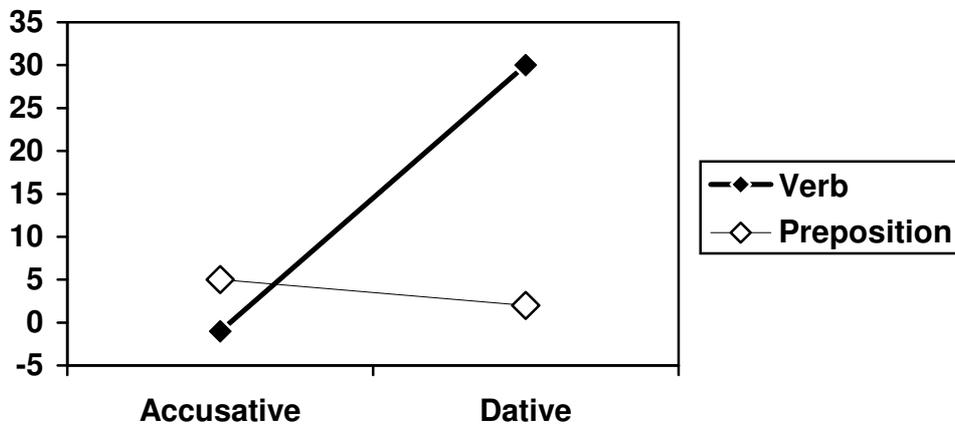

Figure 1 shows a clear interaction between Case and Case assigner. For accusative Case, garden-path strength is close to zero, indicating that ambiguous sentences were as easy to process as unambiguous control sentences, for both the verbal and the prepositional condition. For dative Case, in contrast, a substantial garden-path effect is visible in the verbal condition whereas it is close to zero again in the prepositional condition. Thus, the asymmetry between accusative and dative for objects of verbs observed in earlier experiments was replicated, whereas no asymmetry showed up for objects of prepositions.

The strong disadvantage for ambiguous dative DPs in dependence of V is, according to our theory, due to the fact that the parser has to reaccess the mental lexicon after the verbal complex at the end of the clause has been received in order to check whether the word forms composing the DP map onto a possible dative in the language. Given our (broadly shared) assumptions about the economy of structure building, it is expected that the structure of a KP will only be superimposed on the Case-ambiguous DP after successful mapping of the word forms. Back-tracking of this kind and reparsing the input is known from classical garden paths, and it is known that it is strongly disfavored by the HSPM. Interestingly, no comparable disadvantage appeared for Case-ambiguous DPs in the context of a preposition, neither with dative nor with accusative Case. This result is surprising for a syntactic theory which takes Case assignment by V and P to be on a par. However, it receives a straightforward explanation in our theory because in this theory P is not the assigner but rather the exponent of Case. A PP is then comparable to an overtly Case marked DP. For the HSPM the two are to a large extent the same because both allow the on-line creation of phrases of comparable phrase

structural complexity, namely PP and KP respectively. In no case is there any back-tracking and reparsing necessary. It is important to notice that the crucial point cannot be the relative earliness of ambiguity resolution. The prepositions in the experiment were all ambiguous with respect to the Case of their object DP. The relevant point is rather the on-line creation of the phrase structure that is required for a grammatically licit completion of the sentence. The occurrence of P leads the HSPM to postulate a phrase structure which embraces a potential locus of lexical Case. No such action is required for a Case-ambiguous DP. If we are right in assuming that the HSPM must postulate only the least amount of structure which is compatible with the input, the postulation of an extra layer of structure (KP) should even be prevented.

6. Summary

We have argued in this article that PPs deviate in various respects from VP, NP, AP because P is a semi-lexical/semi-functional head, unlike V, N and A which rely on additional functional vocabulary. P is in a formal agreement relation with its complement NP or DP. This agreement may give rise to representations in which P contributes features to NP/DP which belong to NP/DP according to conventional linguistic wisdom. Most importantly, P can contribute a Case feature that may be absent in its complement. A number of distinctive properties of PPs become understandable under this proposal, e.g. the facts that P is in many languages obligatorily pied piped, that P plays a role in copy movement, and that P can have complements which do not only fail as Case bearing categories but do not even qualify as representatives of the categories N or D. There is also the beginning of an explanation of why PPs are transparent for operators which are properly contained in them. The reason is that due to formal agreement between P and its complement in a probe/goal relation, operator features of the goal are transferred to the probe and therefore to the category that is determined by the probe. We have finally shown in which way the processing of Case information in human sentence parsing can benefit from the substructure of P which encodes Case features. The difference between processing difficulty and processing ease which can be found in parsing sentences with Case-ambiguous DPs can hardly be explained on the basis of a syntactic model in which V and P assign Case in a parallel fashion. It can be explained quite straightforwardly, however, within the theory sketched here according to which P may be an exponent rather than an assigner of Case.

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